Member News

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A surprising range extension for *Strophopteryx arkansae* Ricker & Ross, 1975. This species was described from just two males and six females collected from western Arkansas and eastern Missouri. The species was subsequently reported from Kansas by Stewart and Huggins (1977). Poulton and Stewart (1991) provided the first larval description and Oklahoma records in addition to elucidating its range within the Ozark and Ouachita Mountain region, which covers an area of approximately 375,000 km^2 ranging from southern Illinois west to Kansas and Oklahoma and south to the southern border of Arkansas (Poulton and Stewart, 1991). No records of *S. arkansae* have been reported outside of the Ozark and Ouachita Mountain region.

Recently, while collecting from a small stream north of Raleigh, North Carolina, a series of adult and larval *Strophopteryx* were obtained. Initially it was thought these specimens might represent an undescribed taxon as they were obviously different than the other species known from the state, which include *S. appalachia* Ricker & Ross, 1975*, S. fasciata* (Burmeister, 1839), and *S. limata* (Frison, 1942). However, when specimens were worked through the available keys (Ricker & Ross, 1975; Poulton & Stewart 1991; Stewart 2004), adults and larvae were clearly diagnosed as *S. arkansae.*

Comparative material of *S. arkansae* from Arkansas was made available via a loan from the Illinois Natural History Survey Champaign, Illinois (INHS). Morphologically, specimens from Arkansas and North Carolina (AR and NC hereafter) are in agreement. Male cercal processes are similarly shaped and oriented posteromedially (Figs. 1a–b, 2a–b) and the epiprocts (Figs. 1a–b), while not identical, are similar enough to be within the range of intraspecific variation. Females examined from AR exhibit a wide range of variation in both the subgenital plate and sternum 8 (Fig. 3b), far more than the NC specimens (Fig. 3a), perhaps owing to differences between wild caught and reared specimens. But again, specimens are generally in agreement. Larvae were meticulously examined for differences in maculations or setal development and none were found. Head, thoracic, and abdominal maculations are identical between AR and NC specimens (Figs. 4a–b).

In addition to the morphological similarities, habitat and emergence dates appear consistent between Ozark and Ouachita Mountain region *S. arkansae* and the NC population. Poulton and Stewart (1991) documented *S. arkansae* from perennial and intermittent 1^{st}–4^{th} orders streams with adult emergence beginning in early January. Indeed, the NC *S. ark*ansae were collected in mid-January from a 1^{st} order stream in the Carolina Slate Belt, which very likely becomes seasonally intermittent. Specimens have been reserved for future genetic study, but at present, the evidence suggests that *S. arkansae* occurs in North Carolina, which represents a 1064 km range extension (Fig. 5).

The beautiful stream from which this new material was collected is located in Horton Grove Nature Preserve, Bahama, NC (Fig. 5 inset). The Preserve is managed by the Triangle Land Conservancy, who are thanked for permitting access to the exceptional creek. The unnamed stream is in a small, well conserved watershed (1.5 km^2) and possesses a balanced mix of substrates consisting of moss laden boulders, cobbles, gravel, sand and CPOM. The creek has been identified by the North Carolina Division of Water Resources as a possible reference site for small streams (< 3.0 mi^2) in the Carolina Slate Belt. Other adult stoneflies collected with *S. arkansae* include *Allocapnia rickeri* Frison, 1942, *A. wrayi* Ross, 1964*,* and *Zealeuctra uwharrie* Verdone, Beaty, Holland & Kondratieff, 2019. The record for the latter taxon represents a 121 km range extension from its previously known populations.

Material examined: *Strophopteryx arkansae:* **U.S.A. Arkansas: Pope Co.,** Illinois Bayou, 5 mi N Hector at Hwy 27, N 35.52838, W 92.94142, 6 January 1985, B.C. Poulton, 4♂, 6♀, 9L (INHS). **Searcy Co.,** Middle Fork Little Red River**,** 1 mi SE Leslie at Hwy 65, N 35.81644, W 92.54944, 6 January 1985, B.C. Poulton, 2♂, 1♀, 5L (INHS). **North Carolina, Durham Co.,** UT Flat River, Jock Rd. (SR 1626), Justice Trail Loop, Horton Grove Nature Preserve, N 36.12470, W 78.87134, 15 January 2021, C. Verdone, V. Holland, 1♂, 1L (NCDWR); Same location, 17 January 2021, C. Verdone, 6♂, 7♀, 4L, 21E (NCDWR).

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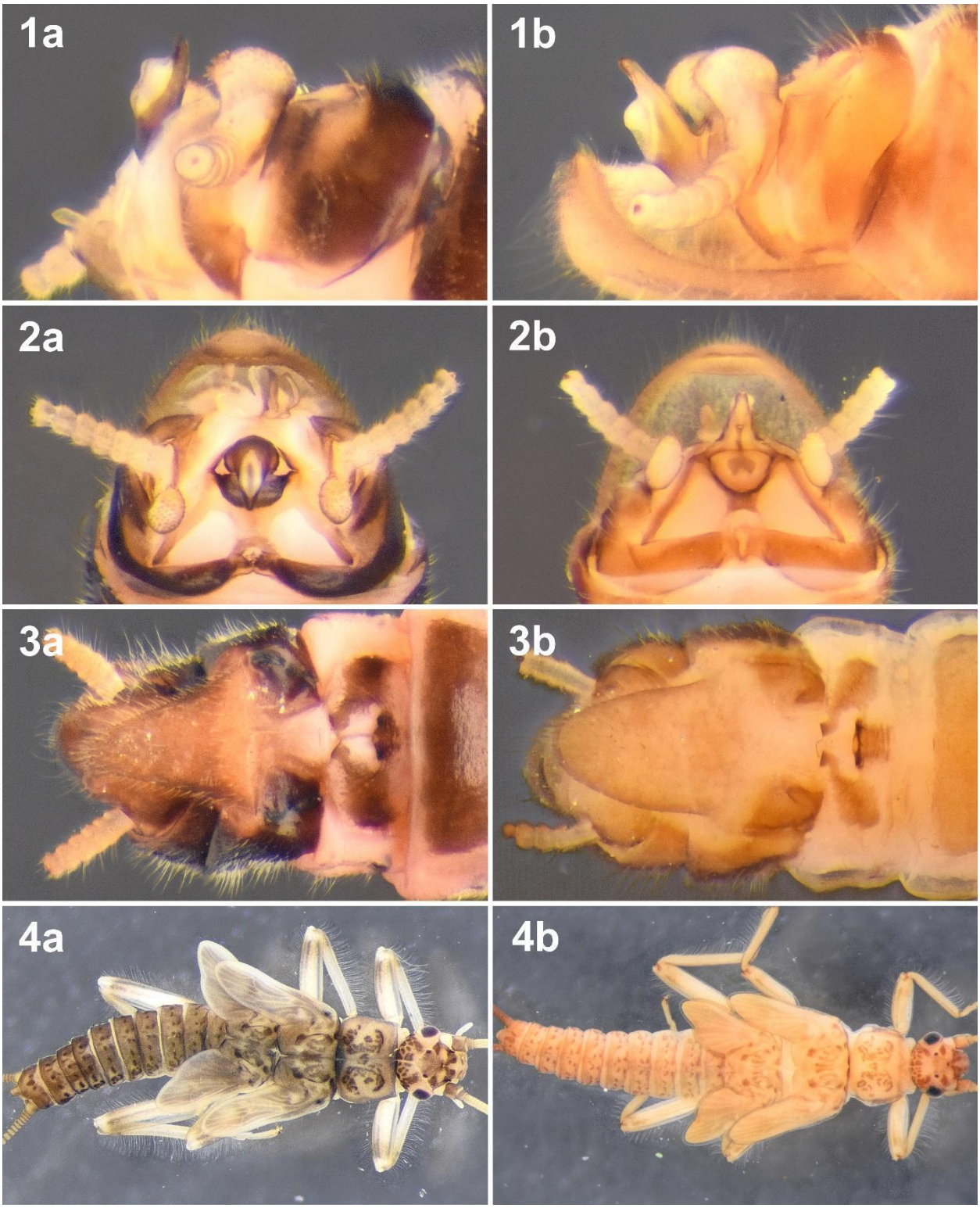

Figs. 1–4. *Strophopteryx arkansae,* 1(a)–4(a) tributary Flat River, NC, 1(b)–4(b) Illinois Bayou, AR. 1. Male terminalia, lateral. 2. Male terminalia, dorsal. 3. Female terminalia, ventral. 4. Larva, dorsal.

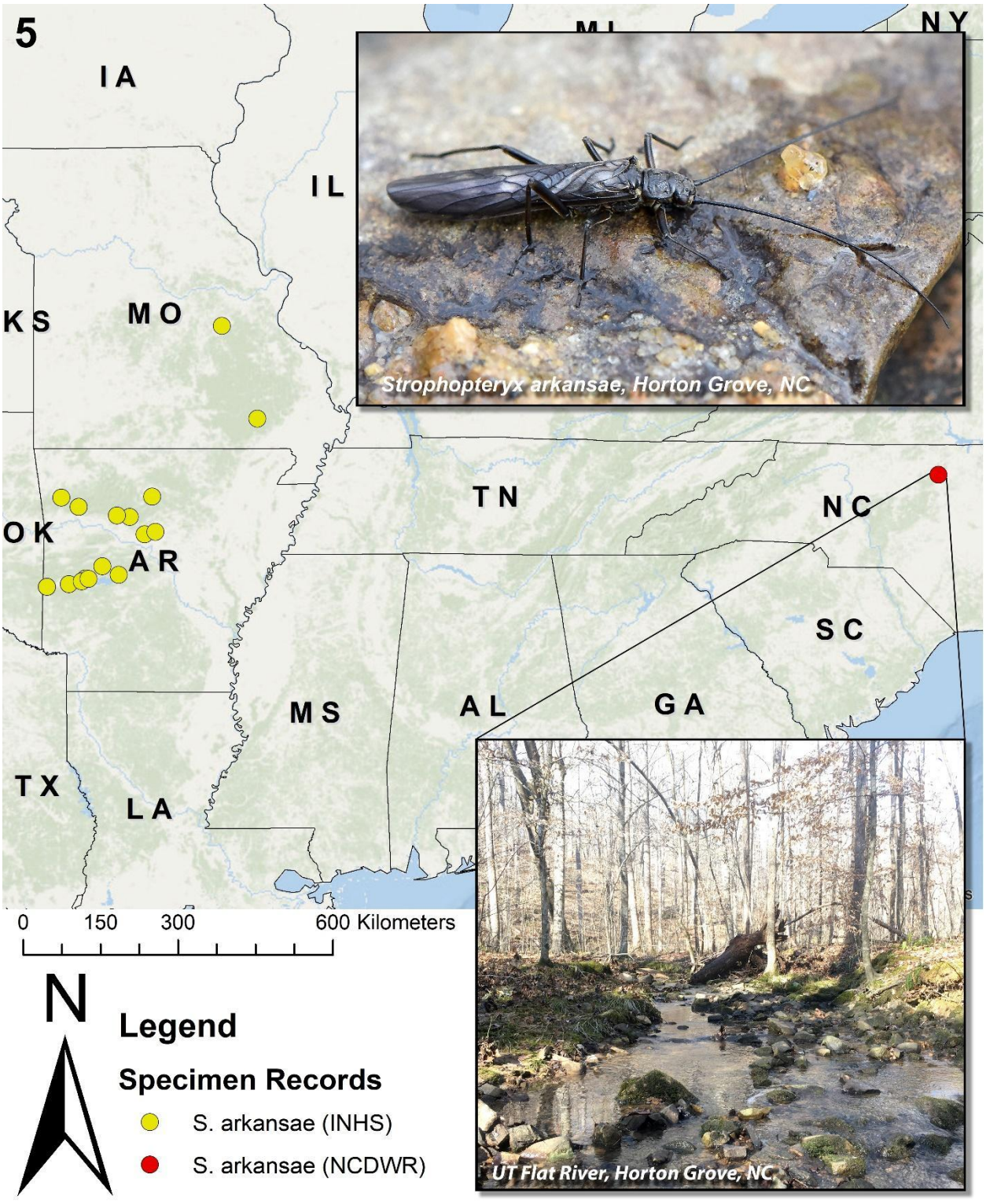

Fig. 5. Illinois Natural History Survey and NC Division of Water Resources records of *Strophopteryx arkansae.*

Common name corrections for *Diploperla janeae* Kondratieff & Verdone & *Remenus daniellae* Verdone & Kondratieff. *Diploperla janeae* Kondratieff & Verdone, 2016 and *Remenus daniellae*, 2018 are both eastern Nearctic stonefly species belonging to the family Perlodidae. When described, the authors erroneously used the Isoperlinae Frison, 1942 subfamily moniker "Stripetail " in their proposed common names which were Jane's Stripetail and Danielle's Stripetail, respectively. Whereas, both taxa belong to the subfamily Perlodinae Klapálek, 1909, the common name of each should have been designated as Springfly rather than Stripetail (Stark et al. 2012). To correct this mistake the replacement name of Jane's Springfly is proposed for *D. janeae* and Danielle's Springfly for *R. daniellae.*

References

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Progress in associating *Isoperla* larvae with adults of the Southeast USA. Aquatic biologists with the North Carolina Division of Water Resources have been associating adults and larvae of *Isoperla* for the past 10 years, linking 28 of 33 regional *Isoperla* species (see Table), 17 of which had previously not been associated. Our rearing efforts resulted in the description of two new species, *I. arcana* and *I. borisi,* and discovery of three more species unknown to science. The three undescribed species are known by the temporary names *I.* "NOT *dicala"*, *I.* "Mayo River" (pictured), and *I.* "species 10". Currently, we await the results of a large *Isoperla* DNA barcoding effort that will help elucidate relationships with congeners and provide support for new species descriptions.

Our overarching goal is to provide a monograph of the *Isoperla* of the Southeast USA, including a richly illustrated key to nymphs, annotations about habitat usage, and distribution maps. Our keys will employ setation patterns, maxillary structures, and pigmentation patterns characteristics of fresh specimens to differentiate between species. Ultimately, some species may remain difficult or impossible to separate but our monograph will be useful for taxonomists, aquatic biologists, and ecologists to identify *Isoperla* in our region.

As we enter our eleventh year of *Isoperla* study, we focus on some interesting nymphal morphotypes that we believe represent new species or the nymphs of previously unknown species. These include two forms resemble *I. transmarina,* whose morphotypes have been reared but require more adult males for positive association.

Isoperla	Nymph Description	Reared	New Association	Range Extension	Probable New Species
arcana	Beaty et al. 2017	X			
bellona	nymph unknown	X	X		
borisi	Beaty et al. 2017	X			
burksi	Frison, 1942	X			
cherokee	nymph unknown	X	X		
cotta	Ricker, 1952	X		X	
davisi	Szczytko & Stewart, 1976; Poulton & Stewart, 1991	X			
dewalti	nymph unknown	X	X		
dicala	Frison, 1942	X			
evanescens *	Verdone & Kondratieff, 2016	X			
fauschi	nymph unknown	X	X		
frisoni	Frison, 1935 (lacinia)				
holochlora	Frison, 1942	X			
kirchneri	undescribed	X	X		
lata	Frison, 1942				
lenati	nymph unknown	X	X		
montana	nymph unknown	X	X		
nelsoni	nymph unknown	X	X		
orata	Frison, 1942	X			
pauli	nymph unknown	X	X		
poffi	nymph unknown	X	X		
powhatan	nymph unknown	X	X	X	
pseudolata	nymph unknown				
pseudosimilis	nymph unknown	X	X		
reesi	nymph unknown	X	X		
signata *	Claassen 1931, Poulton & Stewart, 1991	X			
siouan	nymph unknown	X	X		
slossonae	Frison, 1942	X			
starki	nymph unknown	X	X		
stewarti	nymph unknown	X	X		
transmarina	Frison, 1942				
tutelo	nymph unknown				
zuelligi	nymph unknown	X	X		
"NOT *dicala"*	description pending	X	X		X
"Mayo River"	description pending	X	X		X
nr. *transmarina* - NC	unknown species	X	X		
nr. *transmarina* - VA *	unknown species	X	X		
species 10	description pending	X	X		X
Note: *species not known from North Carolina.					

Nymphal habitus of *Isoperla* “Mayo River”.

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Plecoptera of the Brazilian Amazon. The northern region of Brazil has an exuberant water system fundamental to the ecological balance of the Amazonian drainage. It hosts a rich aquatic entomofauna that has been poorly studied. Unfortunately, these areas have been significantly altered by deforestation, mining, and urbanization without sufficient concern for environmental maintenance. In this context, the Amazon requires special attention regarding non-inventoried locations for the region. Several hydrographic basins remain poorly inventoried for aquatic insects, including Plecoptera. My objective is to inventory and monitor aquatic and semi-aquatic insects, especially Plecoptera, within the Brazilian Amazon. I will expand the taxonomic, ecological, biogeographic and conservation knowledge of the region, including development of a database for aquatic insect specimens stored at the Museu Paraense Emílio Goeldi.

Moacir, sampling an Amazon drainage in northern Brazil.

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Mammoth Cave National Park Plecoptera – Taylor McRoberts and Scott Grubbs. Taylor (WKU MS 2020) recently completed his thesis research, focusing on the influence of flow permanence and stream size availability on the stonefly community and genetic structure at Mammoth Cave National Park. A first manuscript on community structure is in press in Biodiversity Data Journal. A second manuscript quantifying gene flow and comparing genetic structure of two *Leuctra* (*L. alta* vs. *L. schusteri*) species with differing life history strategies is in progress.

Conservation assessment of *Allocapnia cunninghami* - Scott Grubbs. A two-year field study funded by the US Fish and Wildlife Service to assess the present-day distribution of the rare Karst Snowfly *A. cunninghami* was completed in winter 2020 and a paper is currently in press in Journal of Insect Conservation. This species is a potential candidate for listing by the USFWS. Several Malaise traps have since been employed in December 2020 to hopefully add previously-undetected populations and assist in expanding the known range of this species. Distributional modelling and genetic structure research are anticipated at some point in the near future.

Eastern Nearctic Nemourinae - Scott Grubbs and Richard Baumann. The decades long (feels longer, ha!) study of eastern Nearctic Nemourinae is nearing completion. Since the mid-1990s, several new eastern Nearctic species have been described in the genera *Paranemoura*, *Prostoia*, *Soyedina*, and

Zapada. In addition, the authors just completed a comprehensive taxonomic review of *Shipsa rotunda* from across the extensive northern Nearctic range of this species. A *S. rotunda* manuscript has been submitted to the Journal of Insect Biodiversity. Regarding eastern Nearctic Nemourinae, we have assembled plates for all species consisting of line drawings and scanning electron micrographs. Digital light microscopy imaging is the one last task before this monograph can be submitted for publication (journal TBD). This treatment is intended to complement previous monographs on eastern Nearctic Chloroperlidae (Surdick 2004), Peltoperlidae (Stark 2000), Perlidae (Stark 2004), Perlodidae – Isoperlinae (Szczytko and Kondratieff 2015), Perlodidae – Perlodinae (Kondratieff 2004), Pteronarcyidae (Nelson 2000), and Taeniopterygidae (Stewart 2000).

Maryland Plecoptera - Phillip Hogan (WKU MS Student) and Scott Grubbs. Phillip Hogan, working on his Master's research, has been working on a two-pronged, robust study of Maryland stoneflies. The emphasis has been on the tiny Appalachian portion of the state in its western panhandle. Part 1 is a distributional modelling assessment of 15 Appalachian species, all of which are uncommon or rare, and most have been listed as Species of Greatest Conservation Need on at least one USA State Wildlife Action Plan. Data were obtained from Grubbs's fieldwork during the 1990s, targeted fieldwork by Hogan during spring–summer 2020, literature sources with specimen data, correspondence between myself and Rebecca Surdick in the 1990s, and from the Illinois Natural History Survey Insect Collection. Part 2 is a first attempt at a Distributional Atlas of Maryland Plecoptera. Data include the same sources as above. For example, there are ca. 3,000 specimen records (= number of vials) of material alone from Grubbs and Phillip's fieldwork. We also recognize that there may be much material present at the United States National Museum in Washington D.C., all of which has been unavailable for study during the COVID-19 pandemic. Phillip is on track to graduate with his Master's Degree in Biology in May 2021 and publications are in progress and forthcoming.

Systematics of eastern Nearctic *Leuctra* – Scott Grubbs, Madeline Metzger, and R. Edward DeWalt (and hopefully others). Although COVID-19 temporarily derailed plans for broad-scale systematic work with several eastern Nearctic *Leuctra* species groups during spring–summer 2020, namely *L. biloba* Group, *L. grandis* Group, and *L. tenuis* Group, progress is still occurring with plans for new projects and fieldwork during 2021. Targets for future molecular phylogenetic work will focus mainly on uncommon species and will include *L. biloba*, *L. laura*, the rare *L. monticola*, and *L. usdi*. The recent thesis research of Madeline Metzger (WKU MS 2020) included an integrative phylogenetic analysis of the *Leuctra* fauna present at streams draining Mount Mitchell, the high point in eastern North America at 2,037 m (= 6,684 ft) ASL. She collected extensively April–October 2019 and successfully associated nearly all females with males that were DNA barcoding. A manuscript is nearly ready for submission to Canadian Entomologist. This work will build upon the small partial phylogeny published by Grubbs et al. (2020).

More recently, R. Edward DeWalt and I are collaborating on a conservation and taxonomic assessment of the Louisiana Needlefly *L. szczytkoi* funded by the US Fish and Wildlife Service. Past morphological work by Harrison & Stark (2010, Illiesia, 6(03):16-33) strongly suggests that *L. paleo* (southern Arkansas) is a junior synonym of *L. szczytkoi* (central and northern Louisiana). DNA barcoding is needed to settle the presumed synonymy. *Leuctra szczytkoi* is a potential candidate for listing by the US Fish and Wildlife Service. Our work could increase the range and known populations of *L. szczytkoi* considerably, perhaps obviating the need for listing. Fieldwork in fall 2020 was

successful at obtaining *L. paleo* specimens from the type and several nearby localities in Arkansas in and at collecting a large series of *L. szczytkoi* from gorgeous Schoolhouse Springs (type locality – see below). Here, a spring complex issues from the bottom of large, ancient sand dunes left from Pleistocene times. DNA barcoding and phylogenetic analyses will commence this spring. We return to Louisiana, and perhaps Texas, in autumn 2021 to hunt for previously-undetected populations.

USA, Louisiana, Jackson Parish, Schoolhouse Springs with Ed DeWalt in the background. Downstream view. Credit: Scott A. Grubbs, 23 October 2020.

Schoolhouse Springs, looking upstream toward seepage sources. Credit: Scott A. Grubbs, 23 October 2020.

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Plecoptera in the Canadian National Collection. The purpose of this study was to curate the entire CNCI collection of Plecoptera, producing a digital database of all the specimens and constructing and publishing photographic keys for the species of all Plecoptera found in Canada. The work has involved updating taxonomic names, confirming species identification, updating labelling, renewing preservatives, replacing vials and stoppers, photographing specimens for taxonomic identification, and data entry of specimen metadata and photographs into a digital database.

Having started in the fall of 2017, it was hoped to be finished going through all specimens in the collection by end of 2022. Unfortunately, COVID has set the schedule back since I have not been able to work directly on the collection since the spring of 2020.

Currently, the following work has been completed:

- the identification to species of all specimens from Nearctic localities in the collection, except those of the Perlodidae, Perlidae and Pteronarcyidae.
- the complete curation of all identified Nearctic specimens of the Capniidae, Leuctridae, Nemouridae, Chloroperlidae, Peltoperlidae, Taeniopterygidae and the Perlodinae. Over 8000 data

entry points now exist in the database. Access to the database is available using the following url. https://www.cnc.agr.gc.ca/taxonomy/SpecSearchD15.php

- Publication of a photographic taxonomic key to the species of Capniidae in Canada east of Alberta. https://cjai.biologicalsurvey.ca/b_36/b_36.html

Once access to the collection is again available, work will continue to complete the curation of the Plecoptera in the rest of the collection, including the identified specimens of the Perlidae, Isoperlinae and Pteronarcidae, the taxonomic identification of a vast amount of unidentified specimens from the USA and other countries in the World.

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Transcriptome-Based Phylogeny of North American Plecoptera. Eric South (currently a postdoc at the Illinois Natural History Survey) has finished his PhD at the University of Illinois and published the major chapter of his dissertation in Systematic Entomology. See https://onlinelibrary.wiley.com/doi/full/10.1111/syen.12462. This work has resulted in a strong backbone phylogenetic structure from which to build a world phylogeny. He hopes to grow this effort through collaboration with colleagues around the world. One result of this work is strong support for a new family, the first since Styloperlidae in 1989. Kathroperlidae is being proposed with additional genomic data from Korean *Kathroperla doma* and from nearly all members of Paraperlinae from the Nearctic and eastern Palearctic. A revised key to separate Kathroperlidae from other families and all members of *Kathroperla* is provided. Eric leads this effort, currently in review at Insect Systematics and Diversity.

Plecoptera of Indiana. Evan Newman (Master's student in the Department of Entomology, University of Illinois) is writing several chapters: an Atlas of the Plecoptera of Indiana, Analysis of diversity patterns in USGS HUC8 drainages of Indiana, and Conservation Status Assessment of Plecoptera in Indiana. He has amassed specimen data supporting the presence of 92 species in Indiana, several new state records, and many records of rare species in the state.

DNA Barcoding of Great Lakes Area Plecoptera. In collaboration with Cornell University, DeWalt has been barcoding stonefly species of the region. A new species of *Taeniopteryx* intermediate between *T. parvula* and *T. metequi* is highly supported by barcoding. There is some support for a distinct look alike of *T. maura* with males having the meta-femoral spur being shorter and hirsute. I was able to sequence *Acroneuria evoluta*, *A. perplexa*, and *A. covelli* (the holotype!). These will be a start toward understanding the relationships of *Acroneuria* bearing a long ventral strap on the aedeagus (potential *evoluta* group).

Midwest Plecoptera. A new PhD student in my laboratory, Phillip Hogan (of Grubbs lab), has secured summer funds from the Department of Entomology at the University of Illinois to start work on distribution modeling of Midwest stoneflies. His objective this summer is to build the species and natural variables/climate data matrices to build historical and future species distributions for the Midwest (Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin). Modeling will be at the point location scale. He will conduct ground-truthing of models with an appropriate number of randomly picked locations, and assess the importance of natural and climate variables in predicting richness patterns.

Sampling Rare Stonefly Species on Mount Washington, New Hampshire, USA. DeWalt, with the help of colleagues Scott Grubbs, Boris Kondratieff, and Luke Myers (State University of New York, Plattsburgh), will survey for four rare stoneflies on Mt. Washington: *Diura washingtoniana*, *Arcynopteryx dichroa*, *Leuctra laura*, and *Zapada katahdin* 11-20 June 2021. *Diura washingtoniana* was recently resurrected from synonymy and is currently only known from Mt. Washington; *L. laura* is still only known from the male holotype collected on the mountain; *A. dichroa* is highly disjunct in the Nearctic, Mt. Washington being the easternmost known location for it (nearest is Lake Superior), not seen since early in the 20th century; *Z. katahdin* is historically known from a few females collected on the mountain and on other peaks to the north but has not been seen there in decades. We will attempt to collect fresh specimens and DNA barcode specimens. This may lead to collaboration with others: colleagues in Europe and Palearctic who have fresh *Diura* and *Arcynopteryx?* We have permits to retain bycatch from this effort. Many other species of mayflies, stoneflies, and caddisflies will be collected. This material will be stored in 95% EtOH, placed in -20 freezer, and be available for loan.

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We are currently involved in the European project LIFE Watch-ERIC (N/REF LifeWatch-2019-10-UGR-01) that will be carried out in Sierra Nevada National Park (Southern Spain), particularly in the work package "Comprehensive monitoring of watersheds". As part of this project, we will do an intensive study on the Plecoptera biology, both nymphs and adults, in this area.

We are also beginning a project on the role of seasonality in the structuring of river communities from the Guadiana Basin (Spain) and its effect on isolation between/among them. We are employing two approaches, one at community level and other at population level. Within the community approach, we will study the elements of metacommunity structure (EMS) in the whole basin, and also the alpha, beta and gamma diversity of these environments. On the other hand, within the population approach, we are focused mainly on some stonefly species that could be employed as "sentinel species" in the frame of climate change, studying some parameters that allow us to establish the status of each population and its dynamics, such as the net reproduction rate (R0), the intrinsic growth rate (r) and the finite growth rate (λ), as well as other population parameters such as generation time (G), age-specific life expectancy (Ex) and specific reproductive value (Vx). Likewise, the secondary production of each population will be calculated, which is a very reliable indicator of the fitness of the species in the reach it inhabits.

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In recent years, I have published two papers on benthic invertebrates including stoneflies. One is a paper on radioactive cesium pollution caused by the Fukushima nuclear accident, and the other is a paper on recovery from small-scale disturbances. The summary of the two is as follows.

Yoshimura M, Akama A (2020) Difference of ecological half-life and transfer coefficient in aquatic invertebrates between high and low radiocesium contaminated streams. Scientific Reports, 10:21819. DOI: 10.1038/s41598-020-78844-8

The Fukushima Daiichi Nuclear Power Plant accident emitted radioactive substances into the environment, contaminating forest litter, stream algae, sand substrate, aquatic invertebrates, and fish. Because these substances effect also on the stream ecology for longer years, clarifying the diffusion and

decay mechanism of radiocesium is needed. Transfer coefficient differed among aquatic invertebrate groups, and this difference explained the difference of their habitat. The ecological half-life was longer where the air dose rate was lower. Transfer coefficient was also higher at lower air dose rate area. The radioactive Cs concentration of algae was inversely related to the stream current velocity. This relationship between higher Cs concentrations and slower stream velocities was not observed at lower air dose rate area. Because of less silt grain with radiocesium in the lower contaminated area, the radioactive Cs concentration of algae in the rapid-velocity area would tend to be higher than that in the slow-velocity area. This converse phenomenon would lead to continued contamination in freshwater. Decrease of the radiocesium concentration would be continuously proceeded at the higher contaminate area in a visible result, but it would be difficult to be lower when the radiocesium concentration reached to be lower because of the alternation of contamination mechanism. Controlling the water flow is a key to regulating the radioactive Cs concentration in freshwater ecosystems.

Yoshimura M. (2019) The effect of substrate disturbance on benthic invertebrates in old-growth broad-leaved forest and planted conifer forest basin streams in Japan. Inland Waters, 9-4:503–512. DOI: 10.1080/20442041.2019.1599648

Disturbances such as heavy rainfall impact benthic invertebrate assemblages in streams and other lotic systems. In temperate Japan, the steep topography means that even modest rainfall can result in significant substrate disturbance. Impacts of this disturbance on benthic invertebrates were examined for about 1 week and compared in streams of an old-growth broad-leaved forest (OBF) and a planted conifer forest (PCF). Disturbance in this study occurred by kicking the stream substrate. The number of individuals and genera in both forest types decreased after disturbance and gradually recovered over time, but no difference in recovery was observed between the OBF and PCF streams. Benthic invertebrate assemblage composition in both forest types changed depending on the days from disturbance, and differences in recovery between the OBF and PCF streams were observed in the composition of benthic invertebrate assemblages. Recovery patterns of each individual taxa after disturbance were also different. Complete recovery was not observed 1 week after disturbance in either forest type, suggesting more time is required to reestablish pre-disturbance invertebrate community composition.

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A call to improve cooperation and quality. My colleagues and I in China focus on describing new species and redescribing old ones, still, the stonefly fauna in China remains unclear. Comprehensive revisions are needed for problematic groups such as Nemouridae and Perlidae, but competition between colleagues hinders the acquisition of much-needed specimens for such reviews. For the coming year, please let us work to achieve three major research objectives. First, we need to conduct revisions or reviews of species groups, genera, and families to make sense of the fauna. This would be facilitated by sharing specimens, including types, fostering a culture of loaning specimens to each other. Second, we need to preserve many new specimens in a manner that permits sequencing of DNA and RNA that provides additional character states to delimit closely related species, builds a DNA barcode library, and allows for broad phylogenetic analyses. Last, we describe more life stages when possible. To accomplish this, we need to collect a larger series of specimens that include males, gravid females, and the larvae.

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I have decided to return to an old love. In collaboration with A. Fausto (Tuscia University), we resumed the study of sperm patterns in stoneflies. To date, the spermatozoa of just over a dozen species have been characterized, just over one species for each of the seven European families of stoneflies. The aim is to expand the number of investigated species, characterizing a certain number of species and genera within European families. The study of the sperm model of species belonging to families of the Plecoptera of other continents (e.g., Notonemouridae, Scopuridae, Peltoperlidae, etc.) is also envisaged, in order to obtain useful data for systematic purposes.

I am also studying stoneflies collected in Vietnam by colleagues from the Florence University, which has already led to the description of new species of Vietnamese Nemouridae.

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Mongolian Benthological Society (MOBS) scientists will begin collaboration through an online platform (not yet live) to gather and disseminate their research results within the year. The past three decades saw great progress for Mongolian aquatic insect surveys, especially in regards to investigation and capacity building by Mongolians. To promote benthic science in Mongolia the MOBS was founded in Ulaanbaatar in 2009. Its purpose was to create a collection fund and data repository for benthic data and reports, improve scientific capacity in aquatic science through training and the exchange of knowledge, and to enhance cooperation between national and international institutions on Mongolian projects. One of leading scientists at MOBS, Mr. Purevdorj Surenkhorloo (plecopterologist), founded and led the Society to the present. Soon, he will turn over the work to the next generation with hope that they broaden collaboration and continue the important work of the Mongolian Benthological Society.

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Due to an obvious and very sad progress of the last few years, scientific work became practically impossible in the Hungarian Natural History Museum, where I was working as curator and collection leader since 2003. By the end of 2019, I moved to the Department of Zoology, Institute of Biology, Eszterházy Károly University in the NE Hungarian city of Eger, where I found a pleasant and supportive environment to build a new laboratory to study stoneflies. Six bachelors and master's topics on Plecoptera were offered, and students just started to pick up the basic knowledge for starting their research when Covid closed the doors. Since then, teaching is online, and students must wait to start their laboratory work. But, with some restrictions, the laboratories can be used for research, and we are about to restart our international projects abandoned during the preceding years.

The Plecoptera of China – One year long visit of Raorao Mo. In the end of March 2021, Ms. Raorao Mo arrived to Eger with a one year long visiting PhD student fellowship, granted by the Guangxi University, Nanning, Guangxi, China. During her stay, we will work together on certain taxonomic problems of Chinese stoneflies, in cooperation with her supervisor Dr. Weihai Li (Henan Institute of Science and Technology, Xinxiang, Henan, China). One main topic is to redescribe the Chinese

Plecoptera types of the Klapálek Collection, held in the National Museum of Prague.

Korean stoneflies – In cooperation with Dr. Jeong Mi Hwang. During 2020, Dr. Hwang and her colleagues from the Korea University (Seoul, South Korea) collected enormous Malaise trap materials in different mountain systems of South Korea. There are several amazing new taxa (among them a new Perlodinae genus, and the first Palaearctic species of *Pomoleuctra*), and we are about to finish and publish their descriptions during 2021.

Genus level revision of the Capniidae, and the Capniidae fauna of Japan. The revision was my topic for a two years long postdoc fellowship to the Kozo Watanabe Lab, Ehime University, Matsuyama, Japan, and it was close to completion when I returned to Hungary in 2017. Unfortunately, I was not able to finish the morphological analysis, eventhough Drs. Kozo Watanabe and Maribet Gamboa already finished their molecular studies in 2017. I very much hope to complete and finish the manuscripts in 2021, and apologize to all the participating colleagues for the huge delay.

Stoneflies of the Balkans. The last few years I neglected my faunistic exploration of the Balkans. During this winter we tried start again with Tibor Kovács (Mátra Museum, Gyöngyös, Hungary) and prepared faunistic papers on North Macedonia and Serbia. We hope to complete some of the faunistic and taxonomic manuscripts commenced several years before.

Caucasian stoneflies. In 2018 and 2019, we had an international Visegrad Fund project led by Dr. Peter Manko (University of Prešov, Prešov, Slovakia), to sample aquatic insects in Georgian and Azerbaijani areas of the Caucasian region. Other stonefliers of the team were Tibor Kovács, Dr. Gilles Vinçon (Grenoble, France) and Dr. Matej Žiak (Andrej Kmeť Museum, Martin, Slovakia). Our review on the Azerbaijan stoneflies is under publication, this year we are about to publish descriptions of new *Protonemura*.

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I am currently working on the impacts of the devastating 2019/20 Wildfires on the threatened *Thaumatoperla* species. The impacts of the fires are poorly known for *Thaumatoperla* due to deficiencies in their distribution information. My research is surveying the extent of occurrence of *Thaumatoperla* to better improve the distributional knowledge of the species. For this we are using visual survey techniques for the adults and eDNA techniques to test for the presence of the species. Additionally, molecular analyses are being undertaken to establish connectivity between and within the populations. These species are flightless and restricted to individual mountaintops, how the species are dispersing through the landscape and between populations are key questions. Further, the research will identify priority actions to support recovery and conservation efforts for the species, particularly *Thaumatoperla alpina* that is listed as endangered.

A citizen science project for the genus has been set up this year:
https://inaturalist.ala.org.au/projects/alpine-wonders-thaumatoperla

Further information on the project itself:
https://www.latrobe.edu.au/freshwater-ecosystems/research/projects/alpine-stonefly-genus-thaumatoperla

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Ongoing research projects in New Zealand. I am nearing the end of a PhD on evolutionary genetics and systematics in gripopterygid stoneflies, with postdoctoral research fellow Dr. Graham McCulloch and Professor Jon Waters. The gripopterygid fauna of New Zealand is characterised by a high incidence of flight loss in alpine habitats, with over half of all described species being wing-reduced or wingless. In 2019, for example, we discovered a new wing-reduced species no further than the mountain situated above Dunedin city's international airport, and more flightless species from the South Island remain to be described. Currently, spurred by observations from esteemed former member of the society Ian McLellan, we are investigating genes involved in the mimicry of the aposematic, chemically defended austroperlid stonefly *Austroperla cyrene* by at least two gripopterygid species in New Zealand. In a recent synthesis of published literature (https://doi.org/10.1111/aen.12529), it also became apparent that aposematic colouration and chemical defences may be widespread in Australian and South American members of the family Austroperlidae (pictured), and we encourage further examination of species in these regions. The majority of the work in our laboratory group, however, centres around an intraspecific wing-length polymorphism in the *Zelandoperla fenestrata* species group (pictured), which we use to understand the evolutionary and genetic factors driving wing reduction. Recent studies have identified the alpine treeline as a key driver of divergence between full-winged and wing-reduced populations, as well as a gene (*doublesex*) with a potential role in the wing polymorphism. Future projects will investigate potential evolutionary changes in flightless stonefly populations resulting from human-driven deforestation.

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Revision of the African *Neoperla* (Plecoptera: Perlidae: Perlinae). For many years *Neoperla spio* Newman, 1839 was believed to be the only African *Neoperla*. However, it has a restricted distribution and is apparently not common. This revision, based on morphological and molecular evidence which my son, Andreas, and myself will submit this year, establishes a few synonymies between species named by Enderlein, Klapálek and Navás, re-describes the other historical species, and names a number of new ones. Altogether, 80 valid species will be described and illustrated.

Our study deals only with adults and we have accumulated DNA-data for >50 species. Therefore, it will be possible in the future to identify immatures, at least of the common and widespread species. All African species are endemic. One of several African species-groups also contains Asian members, mainly in the SE of the mainland and in the Sunda region, but also in Taiwan. No African species-groups occur in Japan or in the Philippines.

Our study required general knowledge of *Neoperla* species from other continents. During the rest of 2021 we will focus on the position of Neoperlini among Perlinae and on a revised classification of *Neoperla* replacing the present artificial distinction of only two alternative species groups (PZ, in prep.)